Pay for Environmental Performance

The Effect of Incentive Provision on Reducing Carbon Emissions

Robert Eccles, Ioannis Ioannou, George Serafeim, Shelley Xin Li

Ioannis Ioannou
Strategy and Entrepreneurship Area
July 12th, 2013

Motivation

- Reducing carbon emissions is critical for reducing/controlling the impact of climate change. Overall costs of climate change – 5% of global GDP each year
  - i.e. over $3 trillion for 2010.

- Firms are increasingly under pressure to reduce carbon emissions.
- Their incentives/motivation to reduce emissions: regulatory pressure; reputational concern and opportunities; cost reduction through efficiency gains; moral/ethical issues.
- Firms incentivize their employees through rewards in order to induce required behaviours and efforts.

Provision of Monetary Incentives

- **Intel**: includes environmental metrics in the calculations that determine all employees' year-end bonus.

- Sample answers from CDP investor survey:

  - …At a lower management level relevant managers' performance targets are related to the climate change program objectives and **personal bonuses** are influenced by the progress in achieving the goals. A senior manager owns the GHG target…

  - …BG Group operates a cash-based Annual Incentive Scheme (AIS) for its employees. The performance of both the company and the individual combine to determine the value of the award paid under the AIS. The GHG reductions targets **form part of the scorecard for the group** (which covers all employees) against which performance is evaluated…

Provision for Non-Monetary Incentives

- Sample answers from CDP investor survey:
  - …ConAgra Foods **recognizes project teams** for outstanding projects related to "Climate Change and Energy Efficiency" (as well as four other categories related to sustainability performance) through our internal Sustainable Development Awards program. Team members from the five project finalists in each category are invited to Omaha for an awards event and conference. Project teams recognized with a Sustainable Development Award are given $5,000 to donate to an environmental nonprofit in their local community…
  - …Campbell has **several employee recognition programs** that can and have been used to provide incentives for management of GHG targets. The Company's most prestigious global recognition, the Campbell Extraordinary Performance Awards has a specific Sustainability Category and both of last year's winners in that category included projects with measurable impacts on GHG targets…

Research Question

- *How effective are monetary and nonmonetary incentives provided by firms to their employees in order to reduce carbon emissions and why?*

Prior Literature

- Effectiveness of monetary incentives
  - Prior research in economics, psychology and other fields shows mixed results.
- What affects the effectiveness of monetary/non-monetary incentives?
  - Benabou and Tirole (2006): A theory of pro-social behaviour
  - A mix of intrinsic, extrinsic, and reputational motives
- Monetary incentives hurt the intrinsic and reputational value of good deeds; while publicity and disclosure encourage pro-social behaviours
  - Experimental results seem to support the theory.
- Providing incentives for reducing carbon emissions is an interesting and appropriate real-world setting to test the pro-social behaviour theory of incentive provision.

Hypotheses

- We conduct our analysis on firm-level, i.e. an aggregate level of employee behaviours as responses to incentive provision.

- On an aggregate level, we have no a priori predictions on the effectiveness of monetary incentives vs. nonmonetary incentives since we have no a priori knowledge on whether employees within the sample firms perceive reducing carbon emissions as pro-social behaviour or Instrumental.

- We hypothesize that monetary incentives are less effective in reducing carbon emissions when firms place them on employees who perceive reducing carbon emissions as pro-social.

Data, Sample Selection and Descriptive Statistics

- **Data and Sample Selection**
  - Incentive provision: from the CDP investor survey (2007-2011) public responses
  - Do you provide incentives on this issue and what type of incentives?

- Carbon emission data, governance structure and the adoption of climate change policies: from Thomson Reuters ASSET4 data base.

- **Final sample size:** 1,683 firm year observations
  - 794 unique firms

- **Key descriptive statistics:**
  - 42.1% monetary; 18.5% non-monetary
  - Large firms; 60% with policies to reduce CO2 emissions; 70% with a board committee responsible for sustainability; 65% identified risks and opportunities from climate change; 47% provide an audit opinion on sustainability disclosure.

Results: Baseline Specifications

	Carbon emissions					
	(1)		(2)		(3)	
	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.
Incentives						
Monetary	**0.215*** **	**3.08**	**0.178*** **	**2.72**	**0.178*** **	**2.87**
Nonmonetary	**-0.141***	**-1.76**	**-0.146***	**-1.88**	**-0.142***	**-1.93**
Scale						
Sales	1.004***	31.14	0.964***	26.23	0.242**	2.29
Employees					0.467***	4.63
Assets					0.369***	4.90
Corporate Policies						
Reduce CO_2 emissions			0.345***	3.68	0.291***	3.01
Reduce transportation emissions			-0.171*	-1.87	-0.165*	-1.76
Reduce supply chain emissions			-0.176**	-2.07	-0.190**	-2.35
Business case for climate change action						
Commercial opportunities/risks			0.076	1.11	0.044	0.66
Sustainability Governance						
Sustainability committee			0.134	1.62	0.081	1.08
Sustainability audit			0.267***	3.48	0.236***	3.17
Intercept	5.839	11.61	5.813	12.07	4.010	7.46
Country fixed effects	Yes		Yes		Yes	
Industry fixed effects	Yes		Yes		Yes	
Year fixed effects	Yes		Yes		Yes	
Adj R-squared	83.3%		84.0%		85.7%	
N	1,683		1,683		1,602	

Addressing Alternative Explanations

- Inadequate control for time-varying country or industry effects
  - We introduce time-varying country and industry effects.
- Inadequate control for time-invariant firm-specific effects
  - We introduce firm fixed effects to explore within firm variations.
- Those who provide monetary incentives have higher emissions to begin with
  - We conduct matching analysis based on previous year emission levels and industry membership (comparing firms that switched from no incentives to monetary incentives with firms that consistently provide no incentives).
- The result may not be explained by the perceived pro-social nature of the task
  - We vary the degree of the perceived pro-socialness of the task by interacting incentive types with the perceived task nature.
- Accounting for how firms choose different incentive types in the first place; we might inadequately control for the propensity to choose an incentive type
  - We use a two stage multinomial logistic model to explicitly take into accounts firms' choice of incentive types in the first stage and control for the propensity of firms to choose a certain incentive type.

Models with Firm Fixed Effects

	Carbon emissions		Carbon emissions/sales	
	Coefficient	t-stat.	Coefficient	t-stat.
Incentives				
Monetary	**0.071**	**1.64**	**0.113*** **	**2.29**
Nonmonetary	**-0.099**	**-1.39**	**-0.128**	**-1.57**
Scale				
Sales	0.117	0.83		
Corporate Policies				
Reduce CO_2 emissions	0.042	0.43	0.060	0.58
Reduce transportation emissions	-0.122	-1.17	-0.089	-0.77
Reduce supply chain emissions	0.079	1.10	0.096	1.30
Business case for climate change action				
Commercial opportunities/risks	0.091	0.76	0.149	1.18
Sustainability Governance				
Sustainability committee	0.000	0.00	-0.018	-0.25
Sustainability audit	0.187	1.47	0.193	1.33
Firm fixed effects	**Yes**		**Yes**	
Country-year fixed effects	Yes		Yes	
Industry-year fixed effects	Yes		Yes	
Adj R-squared	97.8%		98.6%	
N	**906**		**906**	

Results of Matching Analysis

Panel A. Effect in year t

	Diff=Treatment-Control	p-value
t-1	0.021	0.676
t	0.143	0.028
Diffs-in-diffs	**0.122****	**0.046**

Panel B. Effect in year t+1

	Diff=Treatment-Control	p-value
t-1	-0.080	0.504
t+1	0.355	0.057
Diffs-in-diffs	**0.435****	**0.049**

Incentive Types * Perceived Task Nature

	Carbon emissions		Carbon emissions/sales	
	Coefficient	*t-stat.*	*Coefficient*	*t-stat.*
Incentives				
Monetary	**0.288*** **	**3.50**	**0.278*** **	**3.39**
Nonmonetary	**-0.223*** **	**-2.12**	**-0.227*** **	**-2.18**
Environmental Position	0.243	1.94	0.231	1.86
Monetary * Environmental Position	**-0.393*** **	**-2.78**	**-0.385*** **	**-2.74**
Nonmonetary * Environmental Position	**0.101**	**0.76**	**0.098**	**0.74**
Scale				
Sales	**0.961*** **	26.05		
Corporate Policies				
Reduce CO2 emissions	**0.355*** **	3.75	**0.347*** **	3.73
Reduce transportation emissions	**-0.174***	-1.90	**-0.176***	-1.92
Reduce supply chain emissions	**-0.181** **	-2.14	**-0.196** **	-2.42
Business case for climate change action				
Commercial opportunities/risks	0.093	1.35	0.087	1.28
Sustainability Governance				
Sustainability committee	0.129	1.55	0.116	1.43
Sustainability audit	**0.267*** **	3.47	**0.252*** **	3.31
Intercept	5.771	11.63	5.521	12.27
Country fixed effects	Yes		Yes	
Industry fixed effects	Yes		Yes	
Year fixed effects	Yes		Yes	
Adj R-squared	84.1%		78.3%	
N	1,659		1,659	

Multinomial Logistic Regression – 1st Stage

Incentive Type	Firm Motives	Coefficient	t-stat.
No Incentive		(base outcome)	
Only Non-monetary			
Sales	Economic/Institutional	-0.014	-0.13
Commercial Opportunities/Risks	Economic	0.105	0.36
Bonus Plan	Economic	0.280	0.93
% monetary incentives for the country-year	Institutional	0.020	0.02
% non-monetary incentives for the country-year	Institutional	**9.788*** **	10.91
Join UN Global Compact by 2002	Institutional/Ethical	0.523	0.70
Sustainability Committee	Institutional/Ethical	0.286	0.86
Sustainability audit	Institutional/Ethical	0.010	0.04
Reduce carbon emissions	All three	0.472	1.56
Reduce transportation emissions	All three	0.064	0.20
Reduce supply chain emissions	All three	-0.297	-0.87
Intercept		-5.465	-5.03
Only Monetary			
Sales	Economic/Institutional	**0.103***	1.72
Commercial Opportunities/Risks	Economic	0.173	1.05
Bonus Plan	Economic	**0.522*** **	2.93
% monetary incentives for the country-year	Institutional	**5.552*** **	12.36
% non-monetary incentives for the country-year	Institutional	-0.708	-1.47
Join UN Global Compact by 2002	Institutional/Ethical	**0.881*** **	2.60
Sustainability Committee	Institutional/Ethical	**0.568*** **	3.02
Sustainability audit	Institutional/Ethical	0.194	1.19
Reduce carbon emissions	All three	**0.515*** **	3.04
Reduce transportation emissions	All three	-0.160	-0.90
Reduce supply chain emissions	All three	0.091	0.45
Intercept		-5.103	-8.99

Multinomial Logistic Regression – 1st Stage ctd.

Incentive Type	Firm Motives	Coefficient	t-stat.
Both Monetary and Non-monetary			
Sales	Economic/Institutional	**0.268*** **	3.01
Commercial Opportunities/Risks	Economic	**0.594** **	2.50
Bonus Plan	Economic	**0.714*** **	2.87
% monetary incentives for the country-year	Institutional	**5.646*** **	7.54
% non-monetary incentives for the country-year	Institutional	**6.371*** **	10.08
Join UN Global Compact by 2002	Institutional/Ethical	-0.059	-0.11
Sustainability Committee	Institutional/Ethical	0.399	1.30
Sustainability audit	Institutional/Ethical	0.157	0.72
Reduce carbon emissions	All three	0.268	1.14
Reduce transportation emissions	All three	-0.006	-0.02
Reduce supply chain emissions	All three	0.389	1.26
Intercept		-9.997	-10.25
Pseudo R2		0.2626	
N		1,683	

Multinomial Logistic Regression – 2nd Stage

	Carbon emissions	
	Coefficient	t-stat
Only Non-monetary	-0.188	-1.40
Only Monetary	**0.139***	1.88
Both Monetary and Non-monetary	0.029	0.28
Predicted Prob. of Providing Only Non-monetary	-0.728	-1.07
Predicted Prob. of Providing Only Monetary	**0.729***	1.73
Predicted Prob. of Providing Both Incentives	0.438	0.94
Sales	**0.938*****	22.14
Sustainability Committee	0.080	0.91
Commercial Opportunities/Risks	0.049	0.70
% monetary incentives for the country-year	-0.556	-1.22
% non-monetary incentives for the country-year	0.335	0.57
Bonus plan	-0.028	-0.31
Join UN Global Compact by 2002	0.013	0.09
Reduce carbon emissions	**0.301*****	3.19
Reduce Transportation emissions	-0.151	-1.63
Reduce supply chain emissions	**-0.210****	-2.46
Sustainability Audit	**0.237*****	3.06
Intercept	6.177	15.51
Country Fixed Effects	Yes	
Industry Fixed Effects	Yes	
Year Fixed Effects	Yes	
Adj R-Squared	85.11%	
N	1,683	

Contributions

- Timely and highly business-relevant topic with potentially high impact
- Extends the literature on the relative effectiveness of monetary versus nonmonetary incentives for improving task performance, especially when the task is likely to be seen as pro-social behaviour.
- Provides empirical evidence on whether and under what conditions the negative effects of monetary incentives emerge in a real work place setting.
- Contributes to the accounting literature that deals with how task type and the type of incentives affect the efficacy of monetary incentives and may influence the design of management accounting and control systems.

Conclusion

Key take-aways:

- to motivate employees on environmental or social performance, it is important to know *whether and to what extent* employees perceive the incentivized behaviour as pro-social behaviours.

- If, as we show in this paper, most people perceive the incentivized behaviour as pro-social, then monetary incentives are l*ikely to be less effective.*

- Business leaders who are serious about incentivizing employees on environmental or social performance goals, need to *consider the types of incentives they provide*, as well as to *which job positions* such incentives should be provided.

Thank you!